Ordering number: EN4087C

Monolithic Linear IC

LA4598

Two-channel Power Amplifier for Radio Cassette Players (No Heat Sink Needed during 9 V Operation)

Overview

The LA4598 is a two-channel power IC that is intended for use in portable audio equipment. Needing no heat sink during 9 V operation facilitates set design with a small footprint.

Functions

- Thermal shutdown protector built in.
- Standby switch built in.

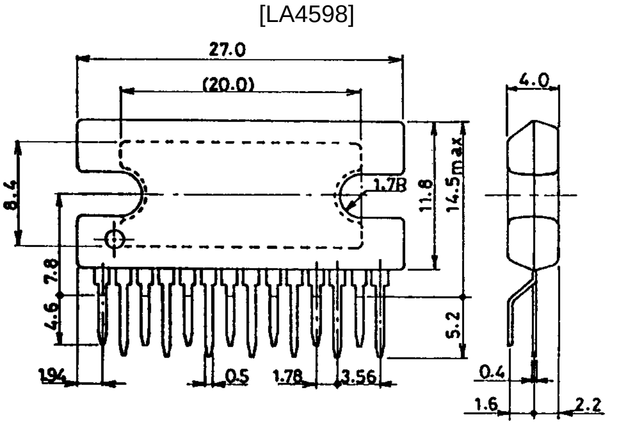
Features

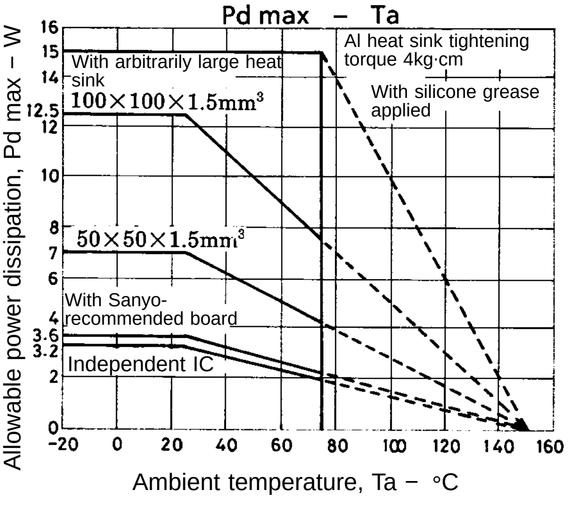
- No heat sink needed during 9 V operation
- P_O = 2.9 W × 2 (V_{CC} = 9 V, R_L = 3.2 Ω, THD = 10%).
- Less quiescent current. (V_{CC} = 9 V, 20 mA, typ).
- Operating voltage range: V_{CC} op = 4.2 to 16 V.

Package Dimensions

unit : mm

3113-SIP14HZ





Specifications

Maximum Ratings at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		18	V
Allowable power dissipation	Pd max*	No heat sink	3.6	W
Junction temperature	Tj max		+150	°C
Operating temperature	Topr		–20 to +75	°C
Storage temperature	Tstg		–40 to +150	°C

* With Sanyo-recommended board (9.0 cm × 8.5 cm × 1.5 mm (thickness))

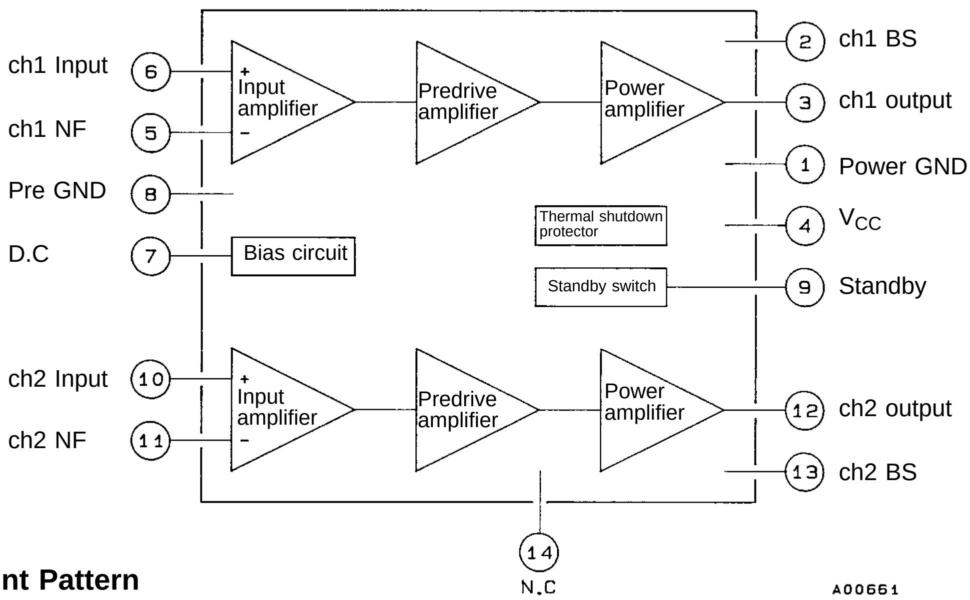
Operating Conditions at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		9	V
Recommended load resistance	R_L		3.2	Ω
Operating voltage range	V_{CC} op		4.2 to 16.0	V

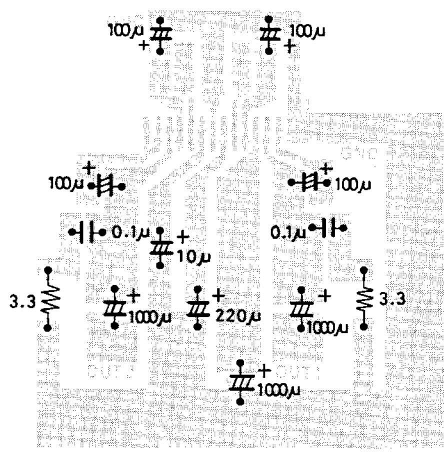
Operating Characteristics at Ta = 25 °C, V_{CC} = 9 V, f = 1 kHz, Rg = 600 Ω, R_L = 3.2 Ω

Parameter	Symbol	Conditions	min	typ	max	unit
Quiescent current	I_{CCO}		10	20	40	mA
Voltage gain	VG		47	49	51	dB
Output power	P_O1	THD = 10%	2.2	2.9		W
	P_O2	THD = 10%, R_L = 4 Ω		2.3		W
Total harmonic distortion	THD	V_O = 2 V		0.3	1.0	%
Input resistance	ri		20	30		kΩ
Output noise voltage	V_{NO1}	Rg = 0, B.P.F = 20 Hz to 20 kHz		0.4	1.0	mV
	V_{NO2}	Rg = 10 kΩ, B.P.F = 20 Hz to 20 kHz		0.6	2.0	mV
Ripple rejection ratio	Rr	Rg = 0, fr = 100 Hz, $V_{CC}r$ = 150 mV	40	50		dB
Channel separation	CH Sep	Rg = 10 kΩ, V_O = 0 dB	45	55		dB
Standby current	Isd				10	µA

Block Diagram



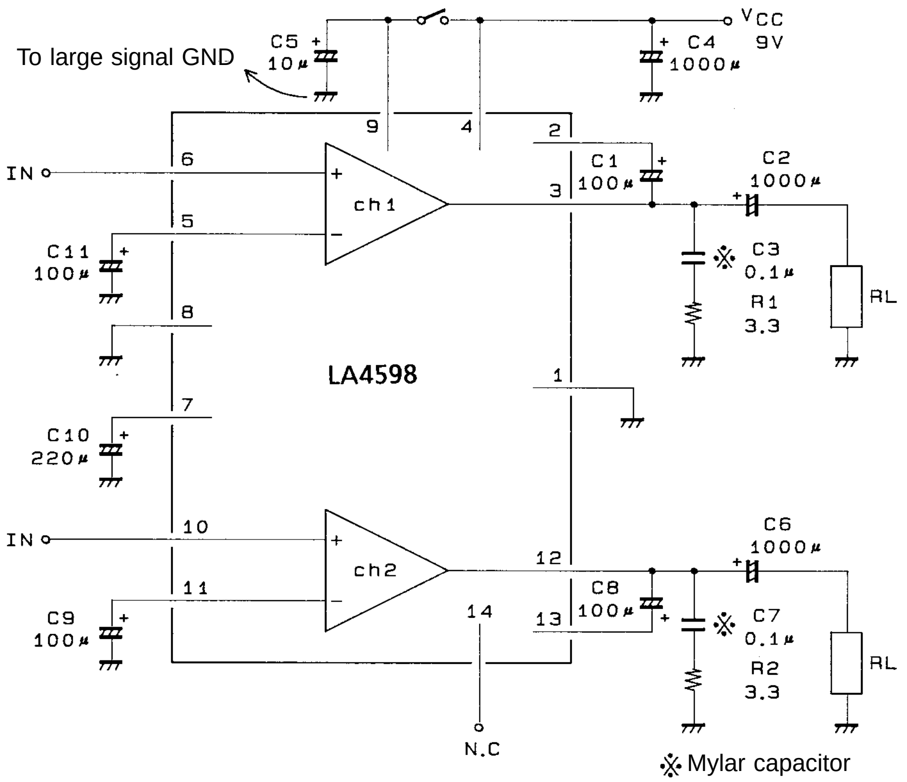
Sample Print Pattern



Unit (resistance: Ω, capacitance: F)

Copper-foiled side 85 × 90 mm^2

Sample Application Circuit



Unit (resistance:Ω, capacitance:F)

※ : Mylar capacitor
C + R can be added to the negative side of the output capacitor.
However, this is true only for a Sanyo-recommended board; for a set board, artwork must also be considered.

Description of External Components

C_1, C_8: Bootstrap capacitors
These capacitors affect low-region output; if the capacitor value is reduced, the low-region output decreases. Therefore, 47 µF or more is desirable.

C_2, C_6: Output capacitors
If the capacitor value is reduced, low-region roll-off frequency f_L and low-region Po worsen.

C_3, C_7: Oscillation blocking capacitors
Mylar capacitor, which is excellent in temperature characteristics and frequency characteristics is used.

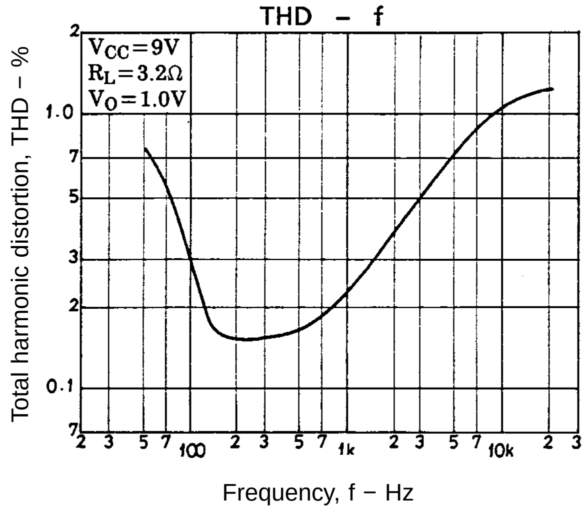
C_4: Power supply capacitor
The capacitor values depends on the power supply line loads (motor, and the like.) and transformer ripple component. 1000 µF to 2200 µF is recommended.

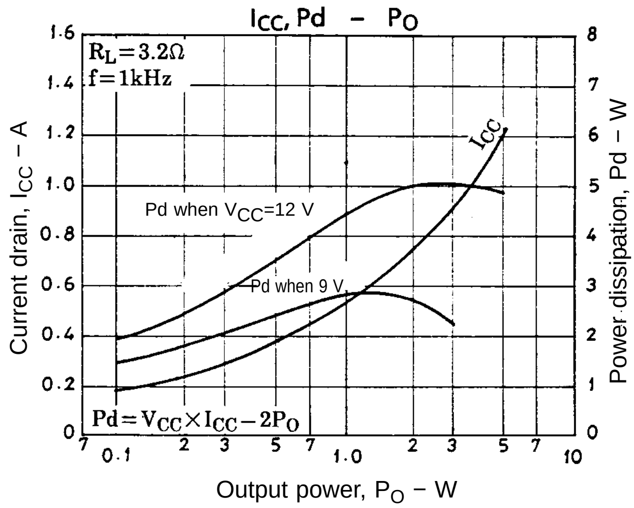
C_5: Standby capacitor
Pop noise reduction capacitor

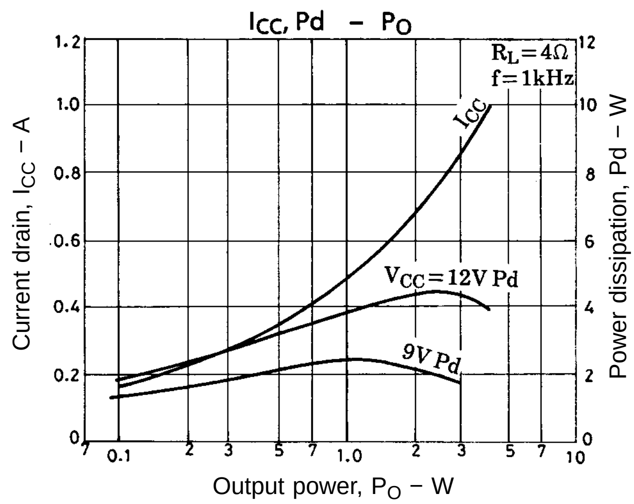
C_9, C_{11}: Feedback capacitors
In addition to affecting low-region roll-off frequency f_L, if the capacitor value is increased, the start-up time is extended.

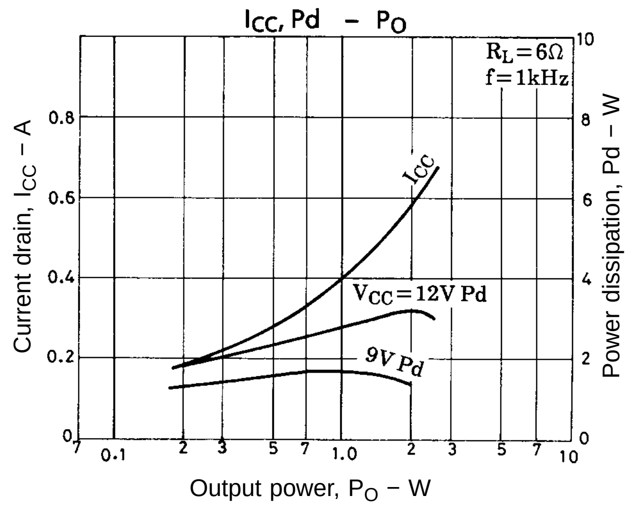
C_{10}: Decoupling capacitor
This capacitor absorbs power supply ripples; 220 µF is recommended.

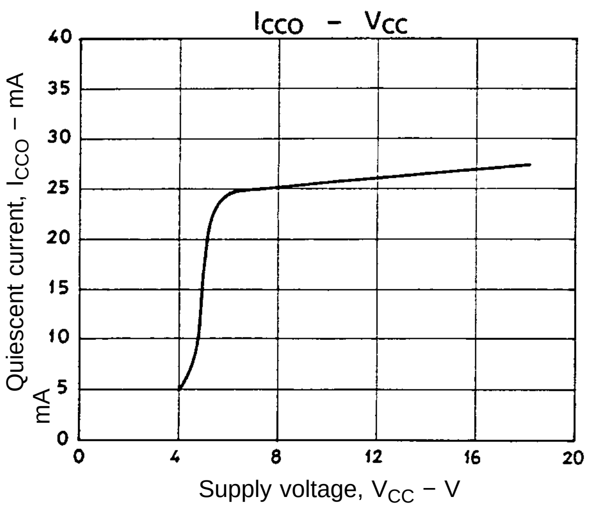
R_1, R_2: Oscillation blocking resistors
The resistor value may be varied 3.3 Ω to 1.0 Ω.

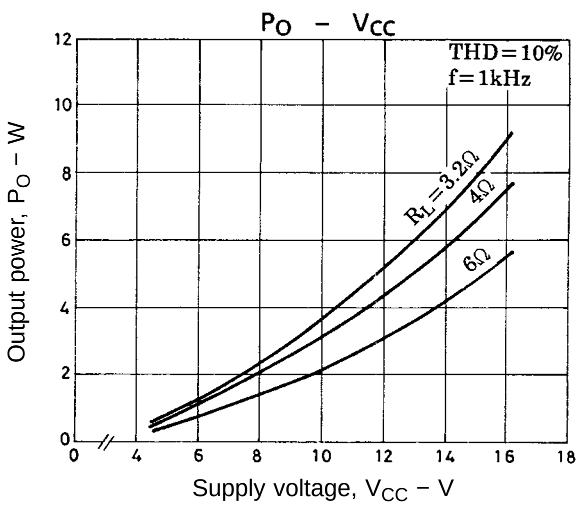

THD – f
V_{CC}=9V
R_L=3.2Ω
V_O=1.0V
Total harmonic distortion, THD – %
Frequency, f – Hz

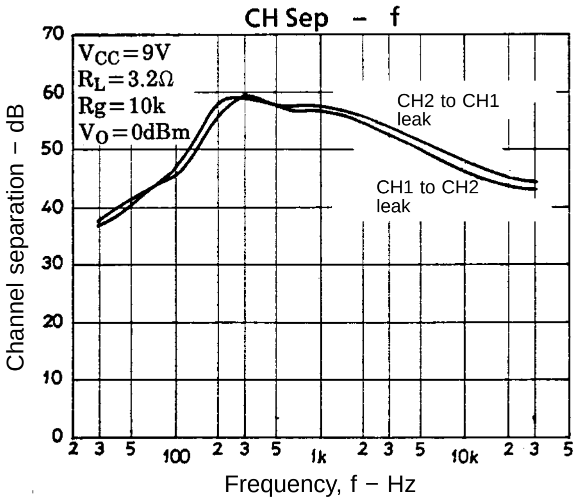

I_{CC}, Pd – P_O
R_L=3.2Ω
f=1kHz
I_{CC}
Pd when V_{CC}=12 V
Pd when 9 V
Pd=V_{CC}×I_{CC}−2P_O
Current drain, I_{CC} – A
Power dissipation, Pd – W
Output power, P_O – W

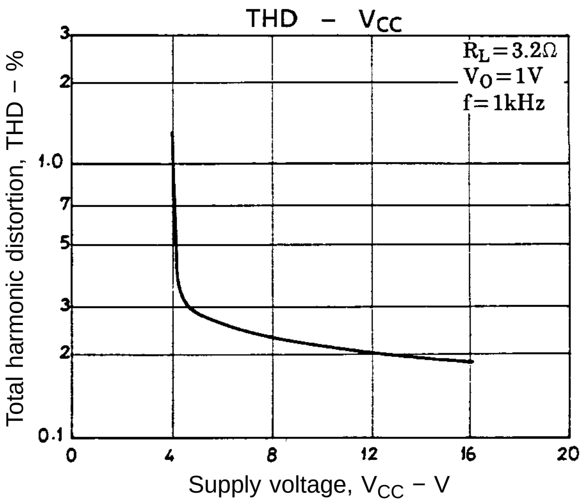

I_{CC}, Pd – P_O
R_L=4Ω
f=1kHz
I_{CC}
V_{CC}=12V Pd
9V Pd
Current drain, I_{CC} – A
Power dissipation, Pd – W
Output power, P_O – W

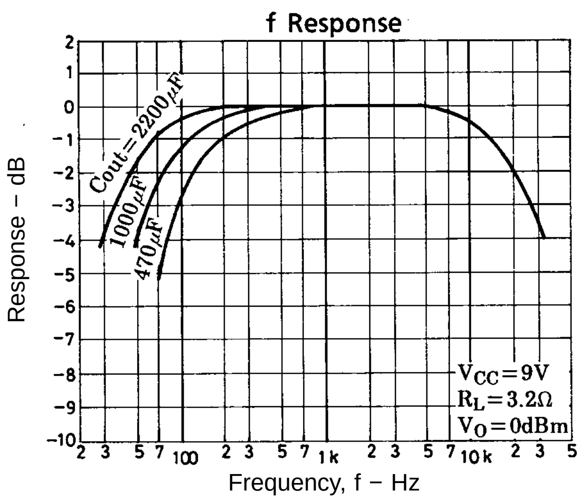

I_{CC}, Pd – P_O
R_L=6Ω
f=1kHz
I_{CC}
V_{CC}=12V Pd
9V Pd
Current drain, I_{CC} – A
Power dissipation, Pd – W
Output power, P_O – W

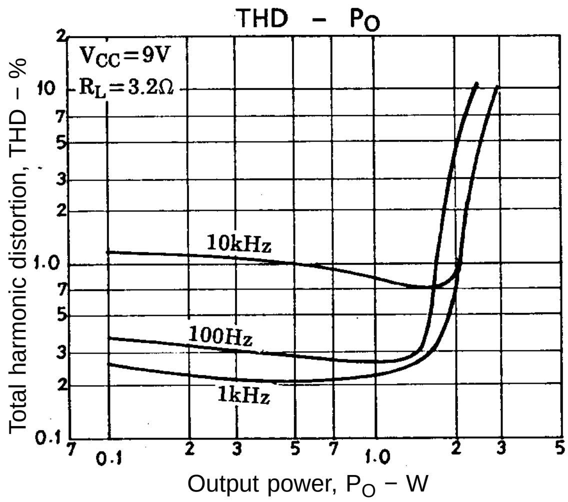

I_{CCO} – V_{CC}
Quiescent current, I_{CCO} – mA
Supply voltage, V_{CC} – V

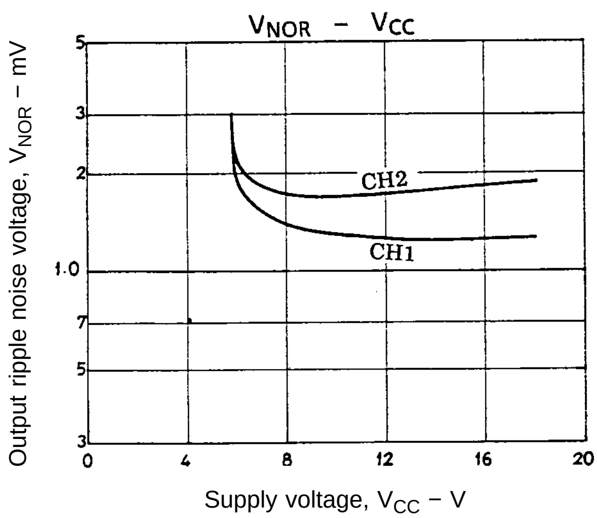

P_O – V_{CC}
THD=10%
f=1kHz
R_L=3.2Ω
4Ω
6Ω
Output power, P_O – W
Supply voltage, V_{CC} – V

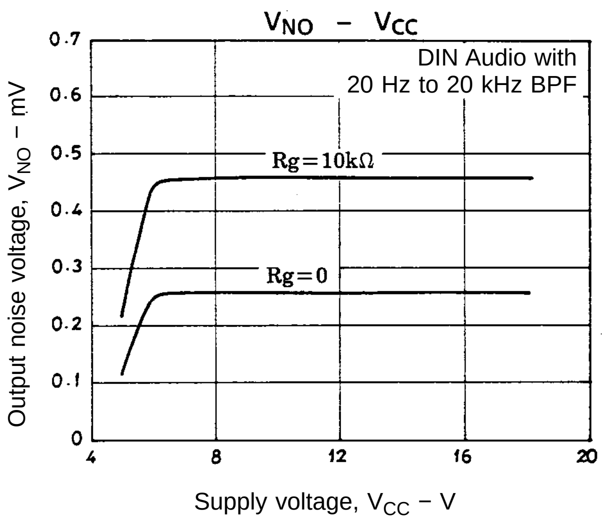

CH Sep – f
VCC=9V
RL=3.2Ω
Rg=10k
VO=0dBm
CH2 to CH1 leak
CH1 to CH2 leak
Channel separation – dB
Frequency, f – Hz

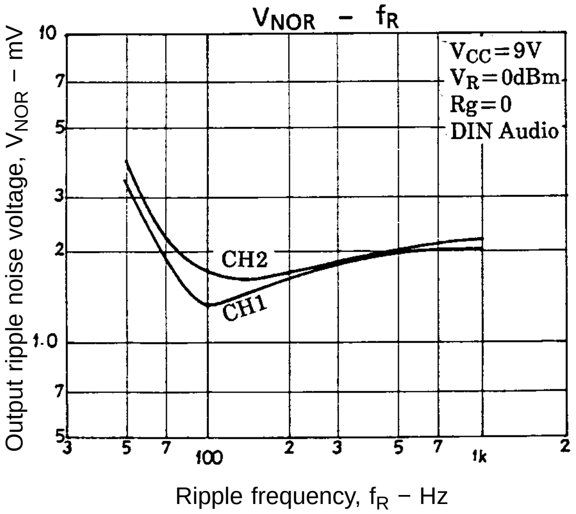

THD – VCC
RL=3.2Ω
VO=1V
f=1kHz
Total harmonic distortion, THD – %
Supply voltage, VCC – V

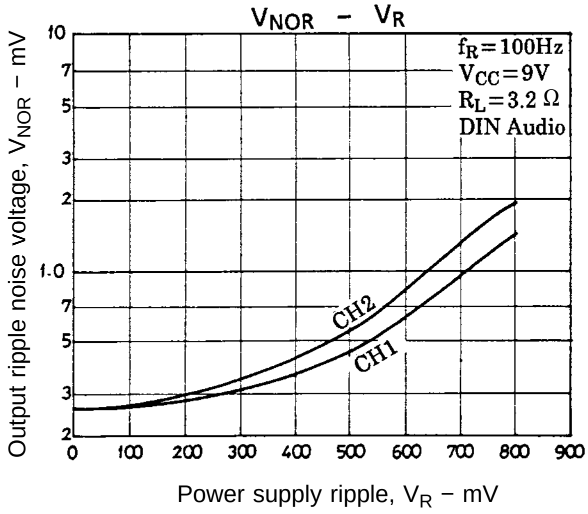

f Response
Cout=2200μF
1000μF
470μF
VCC=9V
RL=3.2Ω
VO=0dBm
Response – dB
Frequency, f – Hz


THD – PO
VCC=9V
RL=3.2Ω
10kHz
100Hz
1kHz
Total harmonic distortion, THD – %
Output power, PO – W

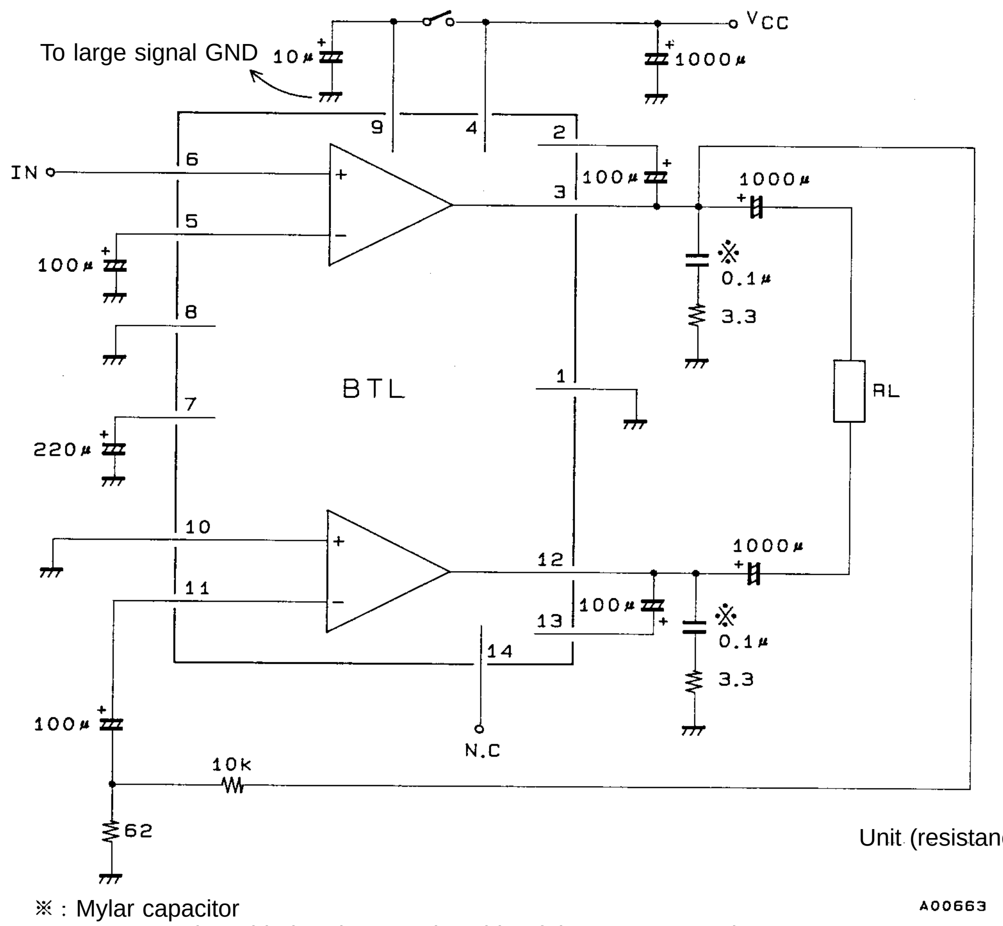

VNOR – VCC
CH2
CH1
Output ripple noise voltage, VNOR – mV
Supply voltage, VCC – V


VNO – VCC
DIN Audio with
20 Hz to 20 kHz BPF
Rg=10kΩ
Rg=0
Output noise voltage, VNO – mV
Supply voltage, VCC – V



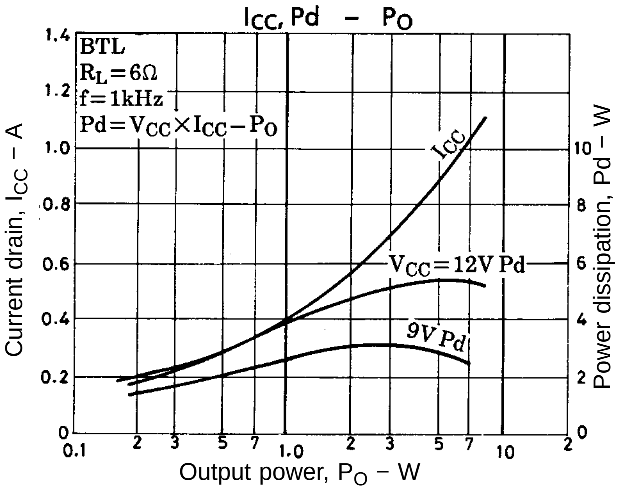


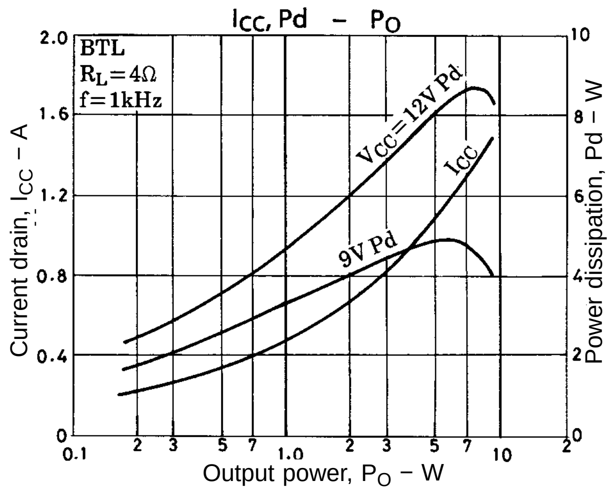
BTL Sample Application Circuit

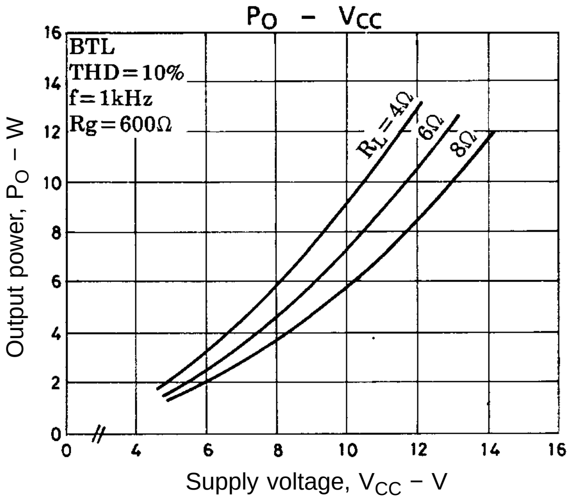


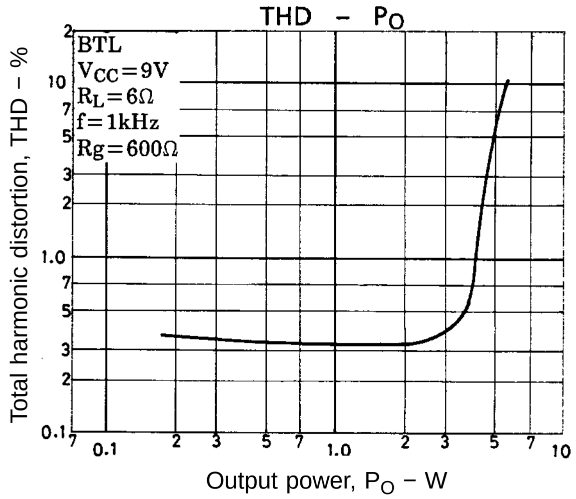
Unit (resistance:Ω, capacitance:F)

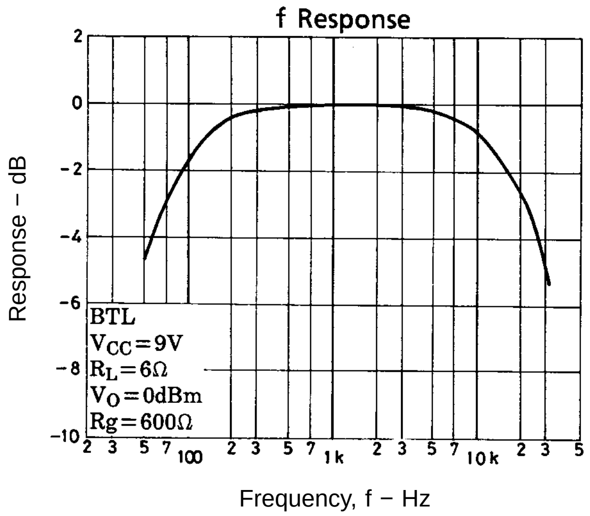
※ : Mylar capacitor
C + R can be added to the negative side of the output capacitor.
However, this is true only for a Sanyo-recommended board; for a set board, artwork must also be considered.


Icc, Pd – Po
BTL
RL=6Ω
f=1kHz
Pd=VCC×ICC–PO
ICC
VCC=12V Pd
9V Pd
Current drain, ICC – A
Power dissipation, Pd – W
Output power, PO – W


Icc, Pd – Po
BTL
RL=4Ω
f=1kHz
VCC=12V Pd
ICC
9V Pd
Current drain, ICC – A
Power dissipation, Pd – W
Output power, PO – W

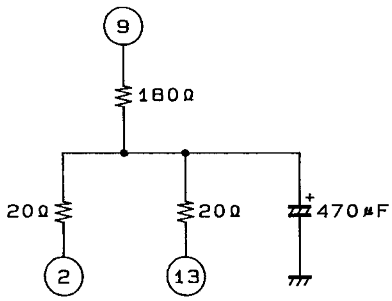

Po – Vcc
BTL
THD=10%
f=1kHz
Rg=600Ω
RL=4Ω
6Ω
8Ω
Output power, PO – W
Supply voltage, VCC – V


THD – Po
BTL
VCC=9V
RL=6Ω
f=1kHz
Rg=600Ω
Total harmonic distortion, THD – %
Output power, PO – W


f Response
BTL
VCC=9V
RL=6Ω
VO=0dBm
Rg=600Ω
Response – dB
Frequency, f – Hz

Features and Usage Notes

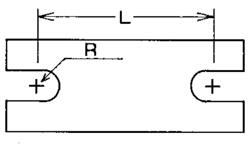
1. VG can be lowered by adding an R_{NF}' to the NF pins (pins 5 and 11).
   Calculated as follows:
   $$VG = 20\log R_f/(R_{NF} + R_{NF}')$$
   The IC contains R_f = 20 kΩ, R_{NF} = 62 Ω.
   However, the following must be noted:
   a) If R_{NF}' is added, the ripple bypass effect due to the NF capacitor will worsen, resulting in a worsening of ripple rejection.
   b) Oscillation stability requires, use at 40 dB or less to be avoided.
2. Pin 9 is intended for standby. It is used in conjunction with power supply pin 4. However, it should be noted that when power supply pin 9 and pin 4 are used for separate systems, the output power is affected by the pin 9 supply voltage.
3. It is recommendable to use no input capacitor. However when rubbing noise generated by the volume control is offencive to the ear, an input capacitor must be inserted.
4. Extreme caution must be exercised when the IC is used in the vincity of the maximum ratings, since even a slight variation in conditions may cause the maximum ratings to be exceeded, thereby leading to breakdown.
5. When making the board, refer to the sample printed circuit pattern. No feedback loop must be formed between input and output. Thick and short wiring is required so that no common resistance exists between the preamplifier GND and power amplifier GND.
6. Addition of components as shown below enables use without introducing an increased distortion at V_{CC} of up to approximately 4.5 V. A capacitor of 470 µF is inserted against pop noise.



A04680

Proper Cares in Mounting a Radiator Fin

1. The tightening torque should be in a range from 4 to 6 kg·cm.
2. The spacing between the screw holes of the radiator fin must match the spacing between the screw holes of the IC. With case outline dimensions L and R referred to, the screws must be tightened with the distance between them as close to each other as possible.



A00665

3. The screws to be used must have a head equivalent to the one of truss machine screw or binder machine screw defined by JIS. Washers must also be used to protect the IC case.
4. No foreign matter such as cutting particles should exist between heat sink and radiator fin. When applying grease on the junction surface, it must be applied uniformly on the whole surface.
5. IC lead pins should be soldered to the printed circuit board after the radiator fin is mounted on the IC.